

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A method of forming a film with a tapered edge in an electronic device, comprising:

providing a substrate;

forming a first film on the substrate;

forming a second film on the first film, the first film having an etch rate that is different from an etch rate of the second film;

forming an etching mask on said second film; and

etching the first and second films using the etching mask to form a resultant film having a tapered edge, wherein the tapered edge is formed at a desired angle of taper that is based on a ratio of relative etch rates of the first and second films.

2. (Original) The method of claim 1, wherein the second film is a disappearing mask layer for the first film, gradually exposing the first film to an etchant so as to induce a tapered edge which slopes to the substrate.

3. (Original) The method of claim 2, further comprising depositing at least one overlaying layer on the first film, the tapered edge ensuring that said at least one overlaying layer is continuous at a junction of the first film with the substrate.

4. (Original) The method of claim 1, wherein said first film includes Al and said second film includes Ti.

5. (Original) The method of claim 1, wherein the etch rate of said second film is faster than the etch rate of said first film.

6. (Canceled)

7. (Original) The method of claim 1, wherein said resultant film after etching is the remaining first film, said first film being a formed bottom electrode of the electronic device.

8. (Currently Amended) A method of forming a ~~electronic device~~ thin film resonator device, comprising:

- (a) providing a substrate;
- (b) forming a first film on the substrate;
- (c) forming a second film on the first film, the first film having an etch rate that is different from an etch rate of the second film, the first and second films to be used to form a bottom electrode of the electronic device;
- (d) forming an etching mask on said second film;
- (e) etching the first and second films using the etching mask to form the bottom electrode with a tapered edge, wherein the tapered edge is formed at a desired angle of taper that is based on a ratio of relative etch rates of the first and second films;
- (f) depositing a overlaying material on the formed bottom electrode; and
- (g) forming a top electrode on said overlaying material ~~by repeating steps (a) to (e)~~.

9. (Original) The method of claim 8, wherein the second film is a disappearing mask layer for the first film, gradually exposing the first film to an etchant so as to induce a tapered edge which slopes to the substrate.

10. (Original) The method of claim 8, wherein said tapered edge ensures that the overlaying layer and any subsequent layers deposited thereon are continuous at a junction of the bottom electrode with the substrate.

11. (Original) The method of claim 8, wherein said first film includes Al and said second film includes Ti.

12. (Original) The method of claim 8, wherein the etch rate of said second film is faster than the etch rate of said first film.

13. (Canceled)

14. (Original) The method of claim 8, wherein the overlaying layer is composed of piezoelectric.

15. (New) The method of claim 1, wherein the desired angle of taper is additionally based on chemical compositions of a selected etch bath used for said etching.

16. (New) The method of claim 15, wherein the first and second films are selected so as to have differing etch rates in the selected etch bath, the selected etch bath being a mixture of phosphoric, acetic and hydrofluoric acids which etches the second film faster than the first film.

17. (New) The method of claim 1, wherein the ratio of etch rates of the second film to the first film is about 2:1 to obtain an angle of taper about 26° .

18. (New) The method of claim 1, wherein the ratio of etch rates of the second film to the first film is about 3:1 to obtain an angle of taper about 18° .

19. (New) The method of claim 8, wherein the tapered edge is formed at a desired angle of taper that is additionally based on chemical compositions of a selected etch bath used for said etching.

20. (New) The method of claim 19, wherein the first and second films are selected so as to have differing etch rates in the selected etch bath, the selected etch bath being a mixture of phosphoric, acetic and hydrofluoric acids which etches the second film faster than the first film.

21. (New) The method of claim 8, wherein the ratio of etch rates of the second film to the first film is about 2:1 to obtain an angle of taper about 26° .

22. (New) The method of claim 8, wherein the ratio of etch rates of the second film to the first film is about 3:1 to obtain an angle of taper about 18° .

23. (New) The method of claim 8, wherein step (g) further includes
- (g1) forming a third film on the overlaying material;
 - (g2) forming a fourth film on the third film, the third film having an etch rate that is different from an etch rate of the fourth film, the third and fourth films to be used for forming the top electrode;
 - (g3) forming an etching mask on said fourth film;
 - (g4) etching the third and fourth films using the etching mask to form the top electrode with a tapered edge, wherein the tapered edge is formed at a desired angle of taper that is based a ratio of relative etch rates of the third and fourth films;
24. (New) The method of claim 23, wherein in step (g4), the forming of the desired angle of taper is additionally based on chemical compositions of a selected etch bath used for said etching.
25. (New) The method of claim 23, wherein
- said first and third films are composed of the same material, and
 - said second and fourth films are composed of the same material.
26. (New) A thin film resonator device, comprising:
- a substrate;
 - an Al film formed on the substrate;
 - a Ti film formed on the Al film, the Al film having an etch rate that is different from an etch rate of the Ti film, the Al and Ti films forming a bottom electrode of the thin film resonator, the bottom electrode formed by etching an etching mask formed on the Ti film so that the bottom electrode has a tapered edge, wherein the tapered edge is formed at a desired angle of taper that is based on chemical compositions of a selected etch bath used for said etching, and based on a ratio of relative etch rates of the Al and Ti films;
 - a piezoelectric layer formed on the bottom electrode; and
 - a top electrode formed on said piezoelectric layer.

27. (New) The device of claim 26, wherein the top electrode is composed of a Al film and a Ti film that is etched as described with the bottom electrode to form the top electrode with a tapered edge, wherein the tapered edge is formed at a desired angle of taper that is based on chemical compositions of a selected etch bath used for said etching, and based on a ratio of relative etch rates of the Al and Ti films used to form the top electrode.

28. (New) The device of claim 26, wherein the ratio of etch rates of the Ti film to the Al film is about 2:1 to obtain an angle of taper about 26°.

29. (New) The device of claim 26, wherein the ratio of etch rates of the Ti film to the Al film is about 3:1 to obtain an angle of taper about 18°.